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# **Residential Ethernet Objectives, Status and Questions**

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# Agenda

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- Objectives summary
- Outline of current consensus approach
- Future work

# Simplified 802.1-based objectives

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- Guaranteed QoS attributes for streams over small diameter (home-sized) network with 7 Ethernet hops max
    - smaller number of hops for MACs with more inherent latency
  - QoS attributes are:
    - latency less than 2ms
    - guaranteed bandwidth (assignable per stream)
    - packets are not dropped
    - once a stream is established, its performance is guaranteed
  - Timing synchronization between DTEs with low jitter and approaching zero wander
    - specs TBD
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# Background

- All proposed mechanisms need bridging support for a full solution
  - “consensus” approach can be fully implemented within 802.1 bridges
    - Worst case is communication of frame start or end TX/RX timing information from MAC to “higher layers”
- May 2005 SG interim in Austin, voted 14-0 to start work on how this might be done ... within the 802.1D structures and architecture
  - This should be done within 802.1, so ... here we are!

# Current consensus approach

- NOT a standard, NOT complete, NOT ready for prime time
  - Part of a detailed investigation of methods and objectives
  - Tries to use existing services (or built on top of existing services) as much as possible
- Precise timing services
- “DiffServ-like” admission control and QOS

# Provide network-wide precise timing information

- For streaming media time stamping -- provide low jitter delivery services to higher layers
- For coordination of multiple streams and user control
- Can be done with higher layers (e.g., IEEE 1588) but at the cost of higher costs and complexity
  - Simplified version optimized for 802.3 using unique Ethertype under investigation
  - Still needs MAC-layer \*specification\* support
    - Or we can continue to use the 1588 hack

# Guaranteed low-latency data service

- Expedited / rate controlled traffic
  - Guaranteed high priority for streams
    - Enforced limits on use of high priority (e.g., no more than 75% of available link bandwidth)
  - Rate controlled traffic
    - Endpoints need to pace traffic
    - Bridges may also need to shape traffic
- Admission control to guarantee QOS
  - Developing solution uses new GARP application “GSRP” and corresponding reservation protocol
    - All soft-state, quite simple
    - Enforcement of reservations only at endpoints

# Future work

- Integrate more of existing and planned bridge capabilities
  - E.g., learn more about how to use the mechanisms that Paul suggested (egress min/max, for example)
- Learn how to get what we want for minimum cost and complexity within 802.1 architecture
  - More work within 802.1, more cooperation with 802.1 developments
- Start “trademarking organization”
  - Select and enforce profiles/options of 802.3/802.1/etc and give them enforceable labels



# **Thank you!**

(backup slides attached)

# Original Objectives with edits for possible 802.1 work

- ~~• Auto-configuration of MAC/PHY, e.g., auto-negotiation, Auto MDI-X~~
- A mechanism to request/grant/assign resources and the default rule(s) for managing the resources ~~(e.g., 802.3ah MPCP)~~
- Support both time-sensitive and best-effort traffic simultaneously, with some bandwidth reserved for best-effort traffic.
- Time-sensitive traffic only supported over 100Mb or greater full-duplex
- Time-sensitive traffic is not disrupted when any station/session is added or removed from the network
- Bounded maximum delay time-sensitive traffic (2ms end-to-end through network; 250us maximum through 1 hop; values to be validated in TF)
- Low jitter and approaching zero wander
- Network provides “house” clock for application synchronization within 5us.
- ~~• Based on existing 802.3 PHY(s)~~
- ~~• Supports IEEE 802.3 Power Over Ethernet~~

Needs to be specified by “trademarking” organization

# Additional objectives which were out of scope for 802.3

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- Bridging between 802.3, 802.11 and 802.15.3 (and other 802 MACs) preserving QoS
  - Compatible with 802.1q
  - No streaming frames dropped, bandwidth is reserved
  - Default policy is first-come, first-served by request
  - Network will automatically reclaim allocated but unused resources
  - Support arbitrary topologies within reasonable limits (802.1d)
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# Assumptions

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- Not intended to be used in provider networks
    - Really for the endpoint “subnets” of the provider networks
  - Control path to assign resources/establish timing hierarchy/etc uses existing 802 services
  - Default policy for resource assignment is first-come, first-served
  - Network will automatically reclaim allocated but unused resources
  - Some bandwidth will always be available for best-effort traffic
  - Latency guarantee of 2ms means that delivery jitter is no more than 2ms as well
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